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9000/61.



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## PATENT SPECIFICATION

|                    |  | Class       | Int. Cl.    |
|--------------------|--|-------------|-------------|
| Application Number | 9000/61.                                     | 52.7; 52.2. | G03d; G03b. |
| Lodged             | 8th September, 1961.                         |             |             |
|                    | Accompanied by<br>Provisional Specification. |             |             |

### Complete Specification

Entitled **IMPROVEMENTS IN OR RELATING TO PHOTOGRAPHIC  
CAMERAS.**

|           |                           |
|-----------|---------------------------|
| Lodged    | 5th September, 1962.      |
| Accepted  | Lapsed before Acceptance. |
| Published | 5th March, 1964.          |

Convention Priority -

Applicant **HAROLD SAMUEL GRIMES.**

Actual Inventor **HAROLD SAMUEL GRIMES.**

|              |                    |                               |
|--------------|--------------------|-------------------------------|
| Related Art: | 141,818(18,952/48) | 52.2.                         |
|              | 152,605(6564/51)   | 52.2; 04.2; 22.5; 52.7; 06.6. |
|              | 147,666(27,905/49) | 52.2; 52.1.                   |

The following statement is a full description of this invention, including the best method of performing it known to me :

This invention relates to photography, and has particular reference to a system of illumination of moving objects which must necessarily be photographed with high definition.

5 In the practice of iridology it is customary to  
examine the condition of the iris of the eye for the  
purpose of diagnosis of morbid conditions existing  
generally throughout the body. For the sake of  
conformation and for purposes of research, it is  
10 desirable to photograph the eye, and particularly the  
iris thereof, in such a manner that the image of the  
object is as large as possible, and therefore covers  
almost completely the image plane of the camera.  
For this purpose, so-called extension tubes are used,  
15 with the result that the object lens of the camera  
equipment is placed in close proximity to the object  
to be photographed.

In the case of the human eye, there is often  
extremely rapid movement of its constituent tissues,  
20 and reflexive movements having a duration of approxi-  
mately 1/750 sec. are common. It is therefore  
essential, in order to obtain sharp pictures, for the  
exposure times to be very short so that such movements  
are "stopped", and consequently it is essential to  
25 provide a very high level of constant illumination,  
especially in the case of the colour film normally  
used in the art, in order to compensate for the  
relatively low speed (or sensitivity) of such colour  
film.

Furthermore, it is essential for the purpose of an accurate diagnosis that the illumination of the iris should be substantially shadowless, and in view of the fact that the object lens of the camera system must be very close to the object in order to obtain large images, it has been found very difficult in practice to provide for high level illumination of a shadowless character in the limited space between the object lens and the object.

It is an object of the present invention to overcome the above and other disadvantages.

According to the invention, therefore, there is provided a photographic system comprising, in combination, an object lens, an extension tube connecting said lens to a camera body, an annular reflector mounted co-axially with the outermost end of said tube and contiguous with said lens, and an arcuate source of illumination mounted within said reflector and wrapped about the periphery of said tube, whereby substantially shadowless conical illumination of an object photographed by said lens is achieved.

A particular embodiment of the invention is described hereinafter with reference to the accompanying drawings, in which like references indicate like parts, and in which:-

Fig.1 shows in front elevation a photographic system constructed in accordance with the invention, and,

Fig.2 in side elevation a section on line 2-2 of Fig.1.

In Figs. 1 and 2 a camera (not shown) having a focal plane shutter and a removable lens system is provided with a system of extension tubes, the inner member of which is adapted to be threaded upon the body of the camera and the outer member 1 of which is adapted to be attached to an object lens 2. One or more intermediate sections may be inserted between the inner and outer extension members and held in position by suitable means, such as screw threads or bayonet fittings. The purpose of such an arrangement is to provide for different scales of magnification of an object to be photographed.

A reflector device formed from perspex or other suitable material is mounted co-axially upon a conical shoulder 3 formed upon the outermost extremity 4 of the outer extension member, and is retained upon said shoulder by means of a screw fitting with which the object lens is attached to said outer member. This reflector consists of a shallow cylindrical box 5 centrally perforated somewhat in the manner of a doughnut and is opaque throughout, excepting for a small annular transparent region upon the face 6 thereof immediately behind and surrounding the object lens 2. The inner surface of the reflector may be coated upon its rearmost wall 7 and its outermost wall 8 with aluminium foil or the like so as to enhance its reflective properties. A similar reflective coating may be provided upon the inner surface 9 of the wall 6. In addition, the transparent annular region of the wall 6 which lies between the lens 2 and the

lens-hood 10 may be given a diffuse surface either upon its rear face or its forward face. The lenshood 10 is an extension of an opaque cover-plate 11 which may be kept in position with respect to the box 5 by means of a circlip 12. A so-called horseshoe or ring-shaped flash lamp 13 is mounted within said reflector between the wall 7 and said transparent region, and is wrapped around the conical shoulder 3 formed upon the outermost end of the extension member hereinbefore described.

The flash lamp may be supplied with electricity from the mains, or from a suitable battery mounted upon or near the camera, and may be connected in a circuit (not shown) and operated in synchronism with the camera shutter in known manner. A further box 16 of similar shape and size to the box 5 may be located to the rear of the last-mentioned box. A condenser 17 may thus be located within the box 16 in convenient proximity to the flash lamp 13, to which it may be connected in a circuit (not shown) to provide a so-called electronic flash system of illumination. This last-mentioned circuit is thus assembled in a compact enclosure which is entirely separated from the camera mechanism. A rear wall 18 of the box 16 may be kept in place by circlips 19 of a kind similar to those employed to retain the wall 11 in position upon the forward face of box 5. The entire illumination apparatus is thus demountable at will upon prizing loose the circlips 12 and 19.

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In a modification of the invention the face of the box 5 may be recessed near its centre so that the front extremity of the lens 2 lies behind the foremost extremity of said face. In this case, a hollow locking nut or the like may be used to attach the lens to the outermost extremity 4 of the outer extension member, and this nut or other fastening means may form, in effect, a lens hood.

In use, the apparatus constructed in accordance with the invention is placed so that the object, namely, the iris of the eye of a patient, is immobilised and the appropriate extension tube or combination of extension tubes is selected so that the image of the iris approximately fills the image plane. That is to say, the image of the eye is made to fill approximately one film frame. The camera is then focussed in known manner so as to give an image of high definition. In order to assist the accuracy of focussing, the lens may be stopped down to a considerable extent by virtue of the high level of illumination available so that the depth of field of the lens system is increased, or if desired, so that the optimum aperture for the lens system is employed. The exposure given to the object, namely the iris of the patient, may then be calculated from a knowledge of the film speed (or sensitivity), the pre-selected lens stop, the known distance from the principal focal point of the object lens to the iris, and the intensity of the light source and thus the shutter speed may be

adjusted accordingly. Owing to the close proximity of the light source to the object, the permissible shutter speed is found to be very high. That is to say, the exposure time is sufficiently short to arrest, for practical purposes, the very rapid movements of the tissue of the eye of the patient. In addition, the fact that the light source is of arcuate formation and surrounds the lens system, ensures substantially shadowless illumination of the object with the result that the photographed image of the patient's iris may be clinically examined in detail without the necessity for any subjective allowance for shadows on the part of the diagnostician. Furthermore, owing to the opportunity which exists to use a very small stop, such as the optimum aperture, the image may possess the highest possible definition since the only distortions introduced by the optical system itself are those due to the residual aberrations inherent in any lens system.

The front or other face of the reflector box 5 may be perforated in any suitable manner so as to admit supply cables for the lamp which constitutes the source of illumination. Two other apertures 14 may be provided in said face to accommodate one or more focussing lamps 15 so placed that their spot-like reflection upon the iris or other reference surface enables rapid focussing of the lens system without the necessity for close examination of any particular surface of the object to be photographed.

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In prior systems an electronic flash source of illumination having an intensity of 225 Joules has been employed in combination with a camera lens having a focal length of 127 mm. and which was stopped down to f45, using colour film known under the Registered Trade Mark EKTACHROME and having a speed rating of 50 ASA. However, in apparatus constructed in accordance with the invention it has been found possible, even when using a lens having the greater focal length of 80 mm., to use an aperture of f22 and a light output of only 100 Joules to produce equivalent results using EKTACHROME.



The claims defining the invention are as follows:-

- 5 1. A photographic system comprising, in combination, an object lens, an extension tube connecting said lens to a camera body, an annular reflector mounted co-axially with the outermost end of said tube and contiguous with said lens, and an arcuate source of illumination mounted within said reflector and wrapped about the periphery of said tube, whereby substantially shadowless conical illumination of an object photographed by said lens is achieved. (8th September, 1961).
- 10 2. A system as claimed in claim 1 wherein said reflector is mounted upon a conical shoulder formed upon the outermost extremity of said extension tube. (8th September, 1961).
- 15 3. A system as claimed in claim 1 wherein the front wall of said reflector is recessed near its centre so that the front of said lens lies behind the foremost part of the face of said reflector. (8th September, 1961).
- 20 4. A system as claimed in claim 3 wherein said lens is attached to said extension member by a hollow locking nut. (8th September, 1961).
5. A system as claimed in claim 4 wherein said hollow locking nut constitutes a lens-hood. (8th September, 1961).
- 25 6. A system as claimed in any one of the preceding claims wherein said reflector comprises a cylinder having opaque rear and outer walls, and a front wall opaque in part but transparent in a region thereof adjacent to said lens. (8th September, 1961).

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7. A system as claimed in any one of the preceding claims wherein said opaque walls, or parts of walls, are coated upon their inner surfaces with a reflective material. (8th September, 1961).

5 8. A system as claimed in claim 7 wherein said reflective material is aluminium. (8th September, 1961).

9. A system as claimed in any one of the preceding claims wherein said source of illumination is a so-called electronic flash lamp. (8th September, 1961).

10 10. A system as claimed in any one of the preceding claims wherein one or more focussing lamps is located within apertures formed in a front wall of said annular reflector. (8th September, 1961).

15 11. A system as claimed in any one of the preceding claims wherein said source of illumination is supplied by electric cables passing through apertures in said reflector. (8th September, 1961).

20 12. A photographic system substantially as described with reference to the accompanying drawings. (8th September, 1961).

Dated this fourth day of September, 1962,

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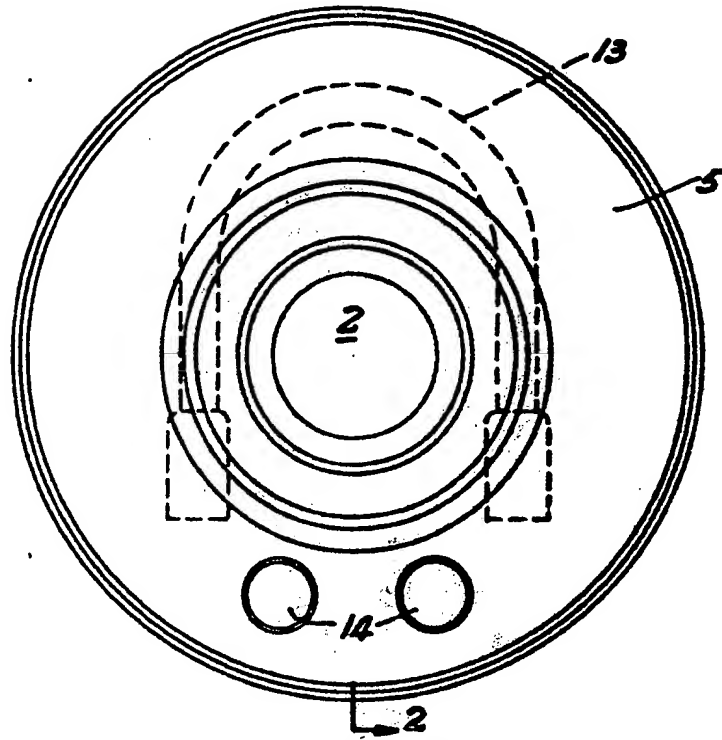


Fig. 1.

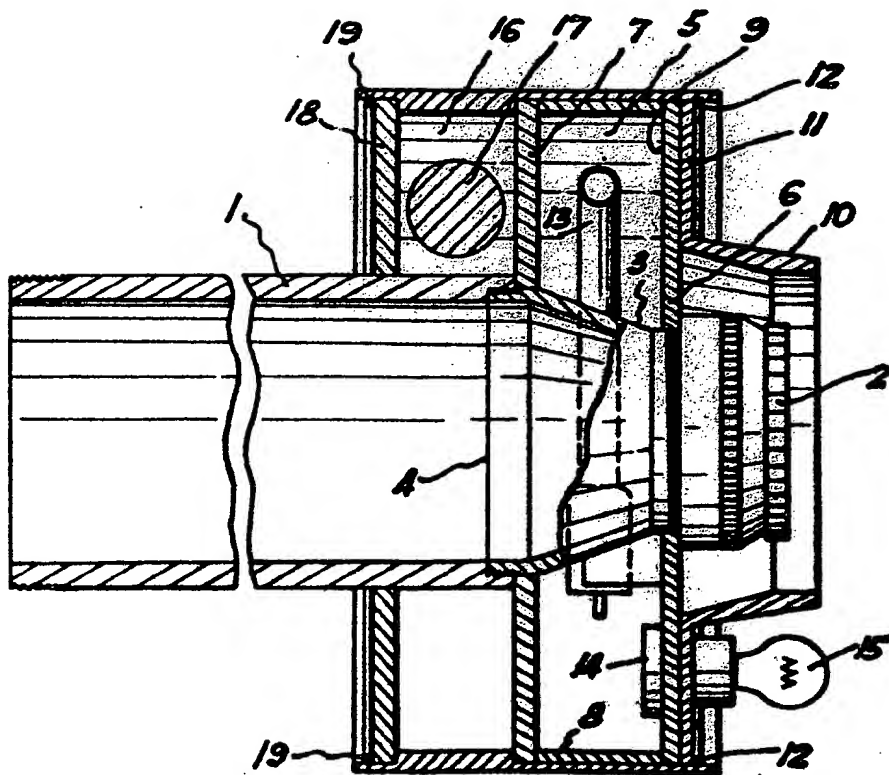


Fig. 2.

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